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Sensory Design for Dementia Care – The Benefits of Textiles

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ABSTRACT The journal article discusses the role of textiles in facilitating sensory enriched environments and meaningful occupation for people living with dementia. It is based on recent interdisciplinary research, a collaboration between design and healthcare, that investigated the provision of multi-sensory experience for people with dementia living in care-homes, particularly the quality and design of Multi-Sensory Environments (MSEs). Through an ethnographic study this investigation unveiled significant design deficiencies of existing facilities in UK care-homes and profound lack of information amongst care professionals and care givers. The absence of textiles and its appropriate use was noticeable. From this research essential design criteria emerged which informed the development of initial design recommendations for setting up MSEs tailored to the specific needs of people living with dementia and their carers. Further, the article discusses the benefits of employing textiles in dementia care – either for occupation or within the environment. Sensorial qualities and psychological benefits are highlighted as well as the potential of applying advanced textile technologies. Further work is suggested regarding three aspects: proof-of-concept and prototyping implementing

the developed design recommendations for sensory enhanced spaces to establish more evidence from end-user feedback as requested by stakeholders; investigating ways of how to achieve sustainable impact through adapting participatory design methods and conveying design skills and knowledge to care practitioners; exploring the potential of textiles and advanced textile technology for design for dementia.

KEYWORDS: dementia care, interdisciplinary, sensory design, well-being, multi-sensory environment, occupational therapy

Introduction

Recent research into the provision of sensory enriched environments and facilitation of meaningful sensory activities in dementia care highlighted the potential of textiles as an important sensorial agent enhancing the wellbeing and quality of life of people living with dementia, particularly in later stages of the disease, and their carers and caregivers. The article reports on findings and outcomes of this ongoing interdisciplinary investigation, a collaboration between textile design and occupational therapy. It discusses the potential role of textiles, including advanced textile technology, in dementia care practice, and explores how the results of the research can be implemented in a long-lasting and sustainable way through user participation and co-design.

Rational and Context

Caring for People Living with Dementia

Dementia is an umbrella term covering a range of several progressive, neurodegenerative disorders, such as Alzheimer's disease, vascular dementia and dementia with Lewy bodies, detrimentally affecting perception, communication and memory. The process of cognitive decline impacts a person's ability and capacity to cope with and adjust to their environment, to take part in everyday activities and personal care, to interact with others and to meet their own needs (Cohen-Mansfield et al. 2015). People living with dementia can present psychological, behavioural and emotional symptoms, particularly in the later stages of the disease. Changes in mood and behaviour - such as agitation, depression, anxiety, irritability, apathy, or disinhibition - are often an expression of a person's confusion or frustration resulting from limited abilities to communicate and interact, loneliness, need for meaningful activity and occupation, too much or too little stimulation, and discomfort (Cohen-Mansfield et al. 2015).

There is currently no cure for dementia. Recent treatment and care methods therefore focus on optimising living conditions for people with dementia fostering a sense of wellbeing. Particularly in later stages of the disease, care practice needs to support these individuals in maintaining quality of life, dignity and comfort (Strom et al. 2016) by meet-

ing their specific needs and by alleviating behavioural, emotional and psychological changes through non-pharmacological, person-centred approaches (Bidewell and Chang 2011; Goris et al. 2016).

Today 47 million people live with dementia worldwide and it is expected that this number will have risen to more than 131 million by 2050 (Prince et al. 2016). According to the Alzheimer's Society UK, there are 850,000 people with dementia in the UK, with numbers set to grow to over 1 million by 2025 and 2 million by 2051 (Alzheimer's Society no date). This rapid rise of people affected by dementia as well as a growing ageing population has brought on an urgent need for effective and appropriate interventions in supporting dementia care and care for older people - in particular in respect to one of the most important aspect: the facilitation of meaningful occupation and leisure activities as well as environments appropriate for people living with the condition in residential homes. With 70% of the people in living in care-homes having dementia, care providers face a huge challenge. Increasingly, it is questioned what the potential impact is of design on the quality of life and wellbeing of people with dementia, as well as their carers and caregivers.

The Multi-Sensory Environment in Dementia Care: What are the Challenges?

Although there is an increasing loss of cognitive brain function in a person with dementia, the sensory and emotional areas of the brain remain relatively untouched. Hence sensory experiences in everyday life can provide ongoing pleasure and cues for active responses contributing to the individual's wellbeing (Bowlby 1993). Further, sensory input stimulates brain activities that in turn help improving function and performance such as dressing and self-care in people with dementia.

However, people living with dementia are often at risk of sensory deprivation due to age-associated declining performance of the senses and, more significantly, due to their growing dependency and decreasing abilities to initiate their own activities stimulating their senses (Vozzella 2007). On the other hand, sensory over-stimulation, for example in a care-home environment where common areas can be very noisy with too much going on and no spaces to retreat, can also cause sensory deprivation as for the person living with dementia it is difficult to understand and process the information received (Bowlby 1993). Symptoms of sensory deprivation include apathy, reduced alertness, decreased interaction, depression, as well as displaying self-stimulating behaviour such as banging, clapping, rocking, and repetitive verbalizations (Vozzella 2007), or challenging behaviour such as agitation in response to over-stimulation.

Deprivation of appropriate sensory stimulation, either active or relaxing, presents a significant challenge to wellbeing and health as it leads to disorganised behaviour and/or decreased level of activity, potentially aggravating disease-related symptoms (Bowlby 1993; Kovach 2000). Facilitating suitable multi-sensory experiences and environments tai-

lored to the needs of the individual is therefore essential. This is particularly important in late-stage dementia when activities requiring a certain level of cognitive abilities are no longer suitable and the person with dementia responds better to non-verbal communication and opportunities (Vozzella 2007). Potentially, this results not only in the improved quality of life of people living with dementia who feel better about themselves, are calmer, more alert and engaged, with increased function such as self-care. It also enhances the wellbeing of the carer and caregiver who will, with care less demanding, find it easier to kindle and maintain connections and relationships with the person they care for.

In an attempt to provide a solution, the concept of the Multi-Sensory Environment (MSE) was introduced in dementia care. The MSE – sometimes also referred to as “Sensory Room” or “Snoezelen” – is a designated space that aims to provide an enabling, stress-free, positive environment offering sensory enriched experiences and activities – either for stimulation or helping to relax to enhance feelings of comfort and wellbeing and to maximise a person’s potential to focus. It addresses the senses of vision, touch, hearing, smell, taste, and movement with limited or no need for higher cognitive processing. First established by Dutch therapists in the 1970’s for people with learning disabilities unable to participate in more conventional occupation (Hulsegge and Verheul 1987), the concept has been successfully applied with a range of users including people with autism, stroke recovery, or small children. Initially featuring equipment and accessories for activities on a multi-sensory level the MSE, however, has recently been criticised for too much emphasis on sight neglecting other senses and the predominance of high-tech equipment (Gaudion 2011).

Research studies evidenced that the use of MSEs with people with dementia as a resource for meaningful engagement has beneficial effects, such as alleviating behavioural symptoms, e.g. disruptive behaviour and agitation (Maseda et al. 2014) and improving function (Collier et al. 2010). As a consequence, many MSEs were set up in UK care-homes over the last 15 years. However, it had been reported that the use of such spaces in practice has been inconsistent and limited (Andrews 2015; Anderson et al. 2011). It would appear that MSEs were installed with little thought to their design or how they are to be used, and anticipated benefits for residents had not been achieved. Consequently, care-home staff had become discouraged, perceiving the space of little value, resulting in the rooms themselves becoming abandoned (Dalke and Corso 2011).

The Project

Interdisciplinary Research into Sensory Design for Dementia – A Collaboration between Textile Design and Healthcare

Within this context interdisciplinary research into the use of Multi-Sensory Environments (MSEs) in dementia care evolved, critically inves-

tigating the quality of such facilities in relation to the specific needs of people living with dementia and the potential impact of design on improved wellbeing of these individuals and their carers (Jakob and Collier 2017).

The investigation emerged from prior research by both authors who independently identified essential problems and the need for evidence-based research into the functionality and aesthetics of MSEs for people with dementia. Anke Jakob is a design researcher and practitioner with a background in textile design. Her work is concerned with the design for environments related to therapeutic and sensory experiences, and the application of textiles, light and digital media within such spaces. An occupational therapist by profession, Lesley Collier's research explores sensory processing in people with moderate to severe dementia, in particular the efficacy of multi-sensory stimulation in improving occupational performance as well as mood and behaviour. User-centred designers and occupational therapists share an interest in how people function within their environment (Amiri et al. 2017). This common interest and the confluence of knowledge and skills of both researchers culminated in a unique, cross-fertilising collaboration between design and occupational therapy.

The resulting project titled "The Multi-Sensory Environment (MSE) in dementia care: the role of design" was funded by the Arts & Humanities Research Council UK (AHRC). For the purpose of this research a collaborative partnership was formed with independent provider of health and social care services CARE UK. They were keen to support the investigation as they recognised that the research results could potentially improve care practice and care methods regarding some of the most important aspects of dementia care: providing appropriate stimulation and activity.

The research aiming to establish new knowledge to inform coherent, user-centred design solutions for improved care services for those living with dementia, applied a number of methods including:

- ethnographic study examining the current situation in UK care-homes;
- review of examples of best practice from the end-user's point of view;
- design analysis: identifying design criteria responding to the specific requirements of individuals living with dementia;
- developing a design brief.

Critical Study: Existing MSEs in UK Care-homes

In order to establish more evidence why existing MSEs had not been successful, an ethnographic study was carried out involving 16 care-homes in London and South England. The current use of MSEs, their set up and design were recorded, as well as opinions of 32 staff describing the sensory facilities available and their experience in using the existing

MSE rooms with residents. For the study, methods employed included semi-structured interviews, observation of the design and spatial set-up of the facilities, listing sensory equipment and items available under each of the sensory domains, observing sensory sessions from the point of view of the person with dementia, and holding a focus group workshop with activity co-ordinators from several homes.

The results from this critical survey confirmed that most MSEs in care-home settings do not reach their full potential in providing appropriate multi-sensory experience and enrichment for their residents (Collier and Jakob 2016). With progressing dementia, the ability to adapt the behaviour to the environment decreases. It is therefore crucial that the environment, both physical and psychosocial, fits the needs of the individual living with dementia (Bowlby 1993). However, the findings of the study revealed that, in most cases, set-up and design of these existing MSEs is not appropriate and suitable for older people, and residents struggle to engage with the space appropriately (Jakob and Collier 2017). The spaces often do not feature an appropriate range of sensory equipment and accessories addressing all senses. Equipment available is predominantly focused on visual and tactile stimulation. Some of the spaces are perceived as too dark, too technical and “cold” in appearance. Some rooms felt overwhelming due to the number of objects and equipment offered at the same time, or were problematic regarding the juvenile aesthetic of some of the imagery and items used. The lack of textiles and its appropriate use was noticeable, although the multi-sensory qualities intrinsic to textiles offer many benefits.

Another important finding was that in the absence of sufficient information and guidance for care practitioners, facilitation of sensory enriched environments and multi-sensory activities by staff was often very poor. Often the care-homes relied on suppliers of multi-sensory equipment and environments to design and set up the room with little or no involvement of care-home staff. This also led to the prevalent assumption that setting up a multi-sensory facility is cost-intensive because of the expensive special equipment involved (i.e. bubble columns, fibre-optic strands, projectors, vinyl-covered furniture – as can be seen in Figure 1).

User-centred Design Solutions to Improve Dementia Care Practice

In response to the results of the above ethnographic study, the research team went on to analyse and identify the design criteria that would reflect the needs of individuals with dementia and their carers. During this process the researchers drew on following resources: the knowledge established from the study, the results from reviewing best-practice examples and recent literature, and the researchers’ professional expertise and practical experience.



Figure 1

Examples of existing MSEs in care-homes visited during the study. The rooms feature typical MSE equipment such as bubble column, fibre-optic strands, projector with rotating image wheel, glitter/disco ball
Photos: Anke Jakob.

Review of Best-practice Examples

Existing MSE examples from organisations participating in the study as well as other healthcare and MSE facilities in UK and Finland were viewed and evaluated, and successful methods, activities and practices recorded and analysed. Particularly inspiring and insightful were visits to multi-sensory spaces in four homes for older people in Helsinki (Finland) - designed and set up by care home manager and textile artist Sari Hedman (Figure 2). The noticeable difference of these rooms to facilities seen in UK care-homes was the extensive use of textiles and fabric. Particularly striking when first entering a room was the employment of plain, neutral-coloured curtains covering the walls and the use of light-weight, soft fabric “floating” beneath the ceiling. Further, the room featured neutral coloured furnishing and sheepskins, soft blankets and cushions spread across sofas and armchairs. The use of textiles in combination with careful lighting had transformed these rooms into soft, calm spaces, user friendly and appropriate for this age group in terms of both aesthetics and accessibility. The neutral appearance of the fabrics offered flexibility for playing with coloured light and accessories making it possible to adapt the space to the preferences of the user and providing visual focus points.

**Figure 2**

MSEs in care-homes in Helsinki, design and installed by artist and care-home manager Sari Hedman. Noticeable here the extensive use of textiles and plain, neutral-coloured fabrics covering walls, ceiling and furniture. Sheepskins, soft blankets and cushions support the feeling of warmth and softness and provide tactile experience for stimulation or relaxation

Photos: Anke Jakob.

Further examples of applying textiles and textile technology approaches are the use of so called “tactile / sensory cushions”. These cushions designed for people with dementia aim to provide tactile and visual experiences through the application of ribbons, buttons, zips, different textures, embroidery etc. attached to the cushion. They have been found beneficial providing soothing hand occupation as well as stimulation. At the time of the study such items were noted in only 2 of the participating care-homes. In recent years, “tactile / sensory cushions” have been increasingly introduced in care-homes, either through purchase from for example special suppliers of multi-sensory equipment, or by staff making such items themselves for their residents (Figure 3).

Design Analysis: Emerging Key Criteria

Following on from this, a design analysis exercise from the perspective of the end-user established a list of design requirements that are considered by the authors as essential to maximise the benefits of a MSE for people with dementia and support the daily work of their carers and caregivers (Table 1). From this iterative process following key themes crystallised (Jakob and Collier 2014):



Figure 3

Examples of tactile / sensory cushions found in two of the visited care-homes. Embellished with ribbons, zips, buttons etc. they can provide soothing hand occupation, act as a stimulant or/and conversation broker
Photos: Anke Jakob.

- comfortable and safe,
- meaningful and familiar,
- multi-sensory experience,
- stimulation and relaxation,
- control and interaction,
- age-appropriate and usable,
- flexible and cost-effective.

First and foremost, it was recognised that creating an environment where the user feels *comfortable and safe* is vital as this supports the person with dementia to relax reducing stress and anxiety and helping to better focus on activities offered. Similar important is to offer *familiar*, personal and *meaningful* experiences relevant to the individual's life and stage of dementia. As with all occupation offered, sensory activities should reflect the interests and abilities so the person involved is given the best chance to be successful. This will motivate residents to join in and engage in the activities (Bowlby 1993; Vozzella 2007).

A MSE should address all the primary senses to maximize the desired effect. Sensory perception is very individual and in some people it is stronger in one area than another. Also, with aging and progressing dementia, some senses might decline faster than others. Offering *multi-sensory experiences* enables the carer to better respond to individual preferences, needs and abilities. For the person with dementia it provides more than one way to connect to and enjoy their surroundings and/or the activities offered. Also, as the world we live in is highly multi-sensory influencing our perceptions and informing our memories, the person with dementia might find it easier to relate to environments and occupations combining sensorial input on multiple levels.

Setting up a sensory enriched space in a residential home presents an opportunity to create a destination which can be enjoyed by many, including all residents, but also family members and carers as well as

Table 1 Iterative process of identifying key design criteria.

<p>aspects considered important for MSE design</p> <div><div>material</div><div>colours</div><div>textures</div><div>safety</div><div>maintenance / cleaning</div><div>mixing old and new</div><div>low tech vs. hi tech</div><div>familiarity</div><div>relevant experiences</div><div>soft light</div><div>meaningful</div><div>integrating day light</div><div>dimming</div><div>addressing all senses</div><div>stimulating / relaxing</div><div>flexible space</div><div>softness</div><div>room vs. open area</div><div>warm atmosphere</div><div>room size</div><div>open doors</div><div>air quality</div><div>room temperature</div><div>dignity</div><div>feeling safe and secure</div><div>social interaction</div><div>engagement</div><div>multi-purpose</div><div>invisible storage</div><div>integrated switches</div><div>independence</div><div>interactivity</div><div>inexpensive equipment</div><div>introducing nature</div><div>sensory art work</div></div>	<p>emerging themes:</p> <div><div>accessibility</div><div>usability</div><div>relevance / familiarity</div><div>multi-sensory</div><div>appropriate lighting</div><div>comfort and softness</div><div>colours</div><div>supportive climate</div><div>spatial flexibility</div><div>control</div><div>stimulation and relaxation</div><div>technology</div><div>age-appropriate</div><div>interaction</div><div>affordable / cost-effective</div><div>storage</div><div>material</div></div>	<div><div><p>key design criteria:</p><div><div>comfortable and safe</div><div>meaningful and familiar</div><div>multi-sensory</div><div>stimulation and relaxation</div><div>control and interaction</div><div>age-appropriate and usable</div><div>flexible and cost-effective</div></div></div><div><p>design tools:</p><div><div>lighting</div><div>material</div><div>colours</div><div>climate</div><div>technology</div><div>storage</div></div></div></div>
clusters	1st iteration	2nd iteration

care staff. It therefore should support a range of experiences that can be either *stimulating or relaxing* in their effects. For a person suffering from too little or inappropriate sensory input, it gives the chance for focused and controlled active stimulation where the type and intensity of the stimulus can be tuned to the specific needs of the individual. That is particularly important in later stages of dementia where more intensified sensory signals are needed to enhance performance (Collier et al. 2010). On the other hand, for the individual who feels overwhelmed by ongoing activities in the residential home and by other residents, a dedicated sensory space provides a place for retreat, quiet and calming activities.

Further, the environment should offer opportunities for manageable choice. Within their capacities users should be allowed and encouraged to *control and interact* with the environment, including modifying the amount and type of stimulating experience received and exploring the space or intervention at their own pace. Encouraging and empowering the user to play a more active role increases confidence and feelings of self-worth (Valenzuela 2008), giving a sense of personal competency and control (Bowlby 1993) and is considered a more effective care method than passive (receptive) interventions (Sanchez et al. 2016).

The space should be *appropriate for adults*, particularly regarding the aesthetics. It needs to contain equipment and items that are not perceived as juvenile or childish to support dignity and respect for the individual living with dementia (Bowlby 1993; Hope and Waterman 2004). Further, a multi-sensory space in residential homes should be *flexible* and adaptable providing opportunities for a range of activities

and *cost-effective* in their implementation overcoming economic barriers.

Design Guide Book

Based on the identified criteria, a design brief and subsequently design recommendations for installing a successful and effective MSE for people with dementia were developed considering aspects such as the use of textiles, lighting, accessibility, material, use of technology, climate, and maintenance. These initial guidelines were published in a practical, hands-on guide book titled “How to make a Sensory Room for people living with dementia” - freely accessible online in PDF format via kingston.ac.uk/sensoryroom (Jakob and Collier 2014). This resource provides advice and information on setting up a sensory space tailored towards the needs of people with dementia alongside appropriately designed activities. As a tool, it aims to enable carers, care practitioners and care providers to offer conditions that promote the wellbeing of people living with dementia and support dementia care.

The Role of Textiles in Dementia Care

In the course of this research project, the important role of textiles to support dementia care became increasingly apparent. Meeting the Design Criteria listed above, textiles prove to offer benefits on many levels. The vast range of sensorial qualities and physical properties of textiles make it an extremely suited and almost essential material for setting up spaces and facilitating activities with a sensory focus. The perception of sensorial qualities is subjective and individual as it is influenced by factors such as cultural background and personal experiences. The richness of textiles and its diverse possibilities of use offer vast opportunities of sensorial exploration and experience that can meet someone's sensory preferences and psychological needs, e.g. comfort, security, identity, occupation and pleasure.

The Benefits of Using Textiles

Applying textiles as a material to enhance spatial design can create a warm, comfortable and calm atmosphere reducing negative sensory stimuli such as glares and noise. Light and sound are softened when walls, doors and/or ceilings are covered with soft fabrics and the space is enclosed by textiles. Larger rooms, partitioned through curtains, become more comfortable, inviting and intimate. Plain textiles curtains provide a visually calm environment, a neutral backdrop for a variety of activities to experience. The softness, warmth and quietness of such transformed spaces supports feelings of safety and comfort helping to relax enabling the person with dementia to better focus on the activity (Vozzella 2007). The feeling of protection, security and warmth can be further enhanced by wrapping blankets around the body or providing cushions to hold on the lap.

The multi-sensory aspect of textiles is an intrinsic and unique quality. Vision is stimulated not just through colour; it is rather a complex, multi-layered visual experience that textiles can offer through a range of optical qualities, such as shine, texture, reflection, transparency, print. The contrast between opposing qualities (e.g. smooth/textured) and the play of light adds to the experience and playful encounter with textiles. The sense of smell can be addressed by the material's inherent scent (e.g. sheep skin and wool) but also through added fragrances (e.g. infusing textiles with essential oils). Textiles can create sounds (e.g. rustling satin, clacking beads, cracking foil) and they can even provide the experience of taste (chewing as a soothing occupation). The multi-faceted tactile qualities of textiles are another important aspect providing haptic and bodily experiences. Touching velvet and fur for example provides warm softness; silk pleases the skin through its smoothness, lightness and sensual touch; the texture of knitted or woven items may provide reassurance.

Occupational textile objects and activities using fabrics (e.g. folding, assembling, arranging, manipulating, exploring) can draw on these sensory qualities which can prompt emotional reminiscence yet avoid challenging cognition and memory, subsequently providing meaningful occupation (Bowlby 1993). Such engagement with textiles can either have an animating or relaxing effect. Cushions, blankets, textile books or clothing made from various textile materials, with zips, ribbons, buttons, pockets and imagery attached, can encourage playful exploration and interaction, providing experiences of pleasure and increasing emotional wellbeing (Treadaway et al. 2016; Treadaway and Kenning 2016). Sensory armchair covers with pockets and similar accessories for “fiddling” on the other hand allow a person with dementia to calm down and to self-soothe without drawing attention. Textiles can be used to encourage larger body movement for example tactile accessories, colourful bunting, threads or silk scarfs attached to other objects attracting and motivating a person with dementia to reach out to touch (Treadaway and Kenning 2016). Increased physical activity has a positive impact on wellbeing such as improved appetite, mood and oxygen intake (Vozzella 2007).

Textiles have been part of everyday life, either as habitat or clothing, almost since the beginning of human existence. Touching fabric is pervasive within human experience and the intimate daily contact with it is something that everybody is familiar with. Besides familiarly textiles are also extremely flexible and both features present an invaluable advantage making cost-effective, age-appropriate and personalised solutions possible. This includes for example utilising textile curtains to structure and organise spaces – creating spaces that are easily transformable and adaptable to multiple purposes. Technical items such as LED lights become more accessible for the person with dementia and easier to connect with when combined with the familiar medium “textile”, such as sheer fabric softening the light and adding tactility (Figure 4).

Despite their obvious potential, research exploring the sensory qualities of textiles for dementia design benefiting both the persons with

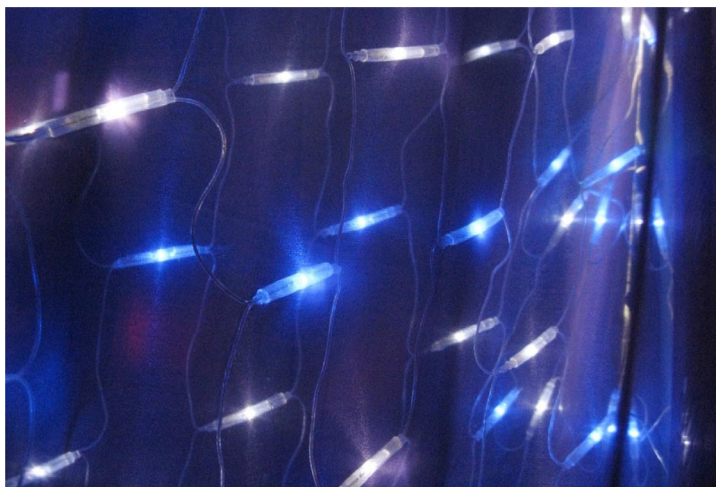


Figure 4

Creating atmospheric, indirect lighting by combining sheer fabric with LED lights
Photos: Anke Jakob.

dementia and their carers is still limited. Successful examples include projects such as “Dementia Aprons”, “Hand i Pockets” and “LAUGH” that investigate the benefits of playful yet age-appropriate textile objects to wellbeing, undertaken by researchers at CARIAD Research Centre at Cardiff Metropolitan University (Treadaway et al. 2016; cariadresearchgroup.cariadinteractive.com). Researcher Rita Maldonado Branco of University of Porto developed textile artefacts, such as a sensory enhanced poncho and a hand-held playful crocheted object, for self-directed occupation and entertainment. Whilst the poncho promotes relaxing stimulation through gently touching and stroking various fabric samples and offers warmth and protection, the ring structure of the crochet work can provide a more active stimulation as it allows more complex finger and hand movements prompting exploration (Maldonado Branco et al. 2016).

Advanced Textile Technology

During the last decade, new textiles technologies, multimedia textiles, and technical fabrics have been emerging and developing rapidly. These new textiles are characterised by surface manipulation and/or embedded electronic technology, such as smart fabrics (ability to react to various physical stimuli) or e-textiles (electronic properties incorporated in the material) (Kettley 2016). Technology contributes to functionality of fabrics and/or becomes part of their aesthetic expression. New surface treatments such as reflective printing inks or hologram coatings offer additional optical features intriguing the eye, whereas reactive materials e.g. thermosensitive inks (changing colour with different temperature) can alter the aesthetic appearance. Fascination with

light and colour has spurred the advancement of illuminated textiles, an umbrella term that includes the use of fibre optics, photoluminescence (Glow-in-the-dark), electroluminescence and LEDs in combination with conductive yarns or fibres.

In the case of LED lighting, technology has been advanced to a level that products have become more user-friendly regarding being washable and durability. As LEDs have become much smaller and easier to integrate within wovens, knits, lace or embroidery, the electronic components adapt much better to the softness and flexibility of textiles. Today fabrics with interwoven electronic circuits and LEDs are available that can be cut and sewn into a garment. Integrating conductive elements also allow adding components for generating sound, vibration, or heat within textiles. The use of conductive material has pushed forward the development of soft switches (textiles sensitive to touch and pressure) which can be embroidered or printed using silver-based inks. Screen-printed circuits seem to hold a lot of potential as, once durability issues are resolved, they could provide solutions for many soft products (Kettley 2016).

Apart from extra functionality, these new technologies significantly enhance the sensorial qualities of textiles encouraging to explore objects or environment on a sensory level. The potential for changeability / reactivity / interactivity adds an element of playfulness and surprise, and opens new possibilities for social interaction and interpersonal communication.

Thus, it seems extremely fitting for advanced textile technologies to be explored and used for dementia design. The medium itself provides a high degree of familiarity making the embedded/added high technology easily accessible for older people with or without cognitive impairment. Combined with more low-tech textile techniques such as stitching and knitting allows personalising items to the individual's preferences, including photos and personal objects, favourite songs or smell. The heightened element of change and surprise supports effective stimulation (Bowlby 1993). The pleasure and fun gained from the sensory experience and the interactive aspect encourages engagement and supports social contact and interaction (Treadaway et al. 2016). With decreasing abilities to initiate personal interaction themselves, sensory props and objects can actively help to provide stimuli for social contact and communication (Vozzella 2007).

Despite the obvious advantages there is remarkable few design research and/or practice applying and exploring these new textile technologies for dementia care yet. Recent examples here include "Tactile Dialogues" and "Sensor e-textiles". The later project by researchers at CARIAD Research Centre, Cardiff Metropolitan University, are new e-textile artefacts, designed to provide sensory stimulation and communicate a sense of personhood. Electronics and new technology such as integrated sound and digital printing have been used in order to extend sensory properties and to embed personalisation into the textile objects, including photos and personal objects, favourite songs or smell (Treadaway and Kenning 2016). "Tactile Dialogues", devel-

oped at Eindhoven University of Technology, consists of a textile pillow with integrated vibration elements sensitive to touch. To be used by a person with severe dementia and a family member or carer, it aims to enable and encourage non-verbal communication through the joint interaction with the product stimulating social connections (Schelle et al. 2015).

Books suggested for further reading about advanced textile technology featuring a comprehensive range of examples from research and practice include “Designing with smart textiles” (Kettley 2016), “Smart textiles for designers: inventing the future of fabrics” (Pailes-Friedman 2016), “Advanced textiles for health and wellbeing” (O’Mahony 2011), and “Textile Futures” (Quinn 2010).

Further Work

MSE Prototyping and End-user Feedback

The results and outcomes from the investigations into design and quality of multi-sensory environments in a dementia care context presented here provide an initial understanding of the design features that need to be considered to achieve the maximum benefit for the end-user. The guide book has been well received amongst the healthcare community; care practitioners have praised the guide as “very inspiring” and “useful, clear and readable”. However, in its present form it can only serve as a first stepping stone in terms of tackling a more complex problem. Feasibility and the need for additional convincing evidence relating to the value of multi-sensory spaces in dementia care requested from stakeholders (e.g. care home managers) have not been addressed in depth yet. Therefore, continued research and proof-of-concept work / prototyping is required to implement, test, evaluate, and adjust the design brief. This will involve the participation of the actual users of MSEs, viz. the people with dementia themselves. So far their direct involvement had been outside the original research remit. Evaluating their experience of the new spaces will deliver valuable knowledge for design optimisation and benefit maximisation.

Sustainable Design

A further important aspect that emerged from the research is the question of how design research and practice can create a long-lasting, widespread and sustainable impact, improving the lives of as many people affected by dementia as possible. Based on the conclusions drawn from their interdisciplinary research and practice, the authors suggest that solutions can be brought on in two ways.

First, the active involvement and continued participation of all stakeholders in the design process (co-design) is essential. Co-design / participatory design is not only an important method of engaging with people living with dementia and their carers, and to learn about their complex needs whilst developing designs to support their wellbeing,

but also vital for skill and knowledge transfer and distribution. An inclusive approach can promote an appreciation of the potential improvement of care methods through design and subsequently have a positive impact on views and attitudes amongst care practitioners (Jakob et al. 2017b). Co-design helps to create an environment where a sensibility for appropriate design solutions can develop and a designing attitude can be cultivated (Jakob et al. 2017a). Hence, further design investigation in respect to the design of MSEs in dementia care will utilise co-creation methods and participatory design activities collaborating with end-users (if possible), with carers and healthcare professionals. Actively engaging carers and healthcare practitioners will help to inform and educate them about the importance and relevance of sensory design in dementia care. Apart from the impact of co-design on healthcare and design practice, the engagement of the person living with dementia in the participatory design process will potentially emerge as a therapeutic activity for the participant holding purpose and meaning (Amiri et al. 2017; Maldonado Branco et al. 2016).

Second, the carers and caregivers need to be equipped with skills, tools and methods that enable them to continue to make and design after the designer has left. It is important that people who care for individuals living with dementia are offered training and education on design skills and design making to empower them to adapt a more creative approach in their care practice. Consequently, further research also needs to address how such skills and training can be conveyed to further the understanding of the value of MSEs and sensory activities for older people living with dementia.

Smart Textiles for Dementia Care

The research established the important role textiles can play in supporting dementia care enhancing the wellbeing of people living with dementia and their carers and care givers. However, design research and practice exploring the potential of textiles in this context is limited and more work is urgently needed. In particular it seems that smart textiles offer many opportunities to develop user-centred, personalised solutions. The authors suggest that creative workshops, where people use their hands and imagination for textile-based craft making, can offer many positive opportunities for both, the individual with dementia and their carer (informal carer or care professionals). Combined with low-tech textile technologies such as stitching, knitting and weaving, e-textile pieces or reactive fabrics can be easily made with components generally available (Giles and Linden 2015). As a sensory activity in itself, it can support building connections and relationships, providing a sense of achievement, acquiring skills knowledge, gaining confidences in making and developing a sense of ownership.

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